X-Ray Regulatory Guide for Veterinary Facilities

Introduction

Operating and safety procedures for x-ray offices are required by Wisconsin Administrative Code HFS 157.74 (Radiation Protection) and are to be developed by the person responsible for the radiation safety in each facility. The model procedures in this regulatory guide are generalized. Each facility must write procedures that are specific for their facility. By using the sections of this guide that apply, the facility may create a unique set of operating and safety procedures. Although other formats are acceptable, information contained in this guide must be included in the operating and safety procedures.

This guide is prepared for medical offices that have not developed their own radiation safety procedure manual. Most larger medical clinics have already developed their manuals and should check the content of this guide with their manuals to make certain the existing manual contains all the necessary information.

The pertinent sections of HFS 157 that apply to veterinary practice are: Subchapter I, III, VIII, X, XI, XII. Within Subchapter VIII, HFS 157.74, .75, .76 (Fluoroscopy), 77, 78 (Veterinary) and .86. HFS 157.81 covers the requirements for submitting shielding plans for review when new facilities are being constructed and when existing radiology rooms are being modified.

The Code was mailed to each office on a CD in September, 2002 or may be obtained from the DFHS web site: http://dhfs.wisconsin.gov/dph_beh/BEH/Xray/index.htm

GUIDE FOR THE PREPARATION OF OPERATING AND SAFETY PROCEDURES FOR THE USE OF X-RAY DEVICES in VETERINARY OFFICES AND CLINICS

I. Sample Operating and Safety Procedures

OPERATING AND SAFETY PROCEDURES FOR

(name of facility)_____

This guide establishes procedures that will minimize radiation exposure to patients and employees. They are provided to comply with regulations enforced by the Wisconsin Department of Health and Family Services, Radiation Protection Section. The regulations require that each x-ray facility be registered with the department and pay annual renewal fees.

A Radiation Safety Officer (RSO) must be designated. The RSO has the responsibility and authority for assuring safe radiation practices and serves as the contact person between this facility and the department. Direct all your questions or concerns on radiation safety to the RSO for this facility, (specify name)_____.

If there are changes in the registration such as change of address or ownership, notice must be sent to the department within 30 days of the change. Change of ownership requires re-registration with full fees paid by the new owner. Addition of new equipment or the replacement of old equipment also needs to be reported. Changes to the registration information may be faxed to (608) 267-4799 or mailed to Division of Public Health, Radiation Protection Section, PO Box 2659, Madison WI 53701-2659

A. Operator Safety

1. ***Training Requirements for Operators of X-ray Machines***
All operators of x-ray machines, including fluoroscopy, must be trained to operate the equipment safely, use proper technique charts, and be able to position the patient properly and to process the film properly. This includes physician operators of fluoroscopic equipment. Each person should be trained in the proper operating procedures for each x-ray machine they will operate. New staff needs to acknowledge receipt of this training by signing-off on the form on Appendix A or similar record.

2. ***Individual Radiation Monitoring Requirements HFS 157.25***
Any adult who is likely to receive a dose from occupational exposure to radiation in excess of 5 mSv (500 millirem) in a year must use an individual monitoring device. No minors may be exposed occupationally to radiation. A veterinary practice that takes x-rays of less than two animals per day does not need to provide dosimeters to staff, unless the staff is a declared pregnant worker. Department x-ray device inspectors can determine whether dosimeters may be needed for staff in occupied spaces adjacent to the x-ray room.

If monitoring devices are worn, they shall be worn at the neck level or on the upper torso. If a protective apron is worn because the operator needs to be less than six feet from the tube or patient, the dosimeter needs to be worn at the collar outside the apron.

Wisconsin Administrative Code HFS 157.88 in Subchapter X discusses the requirements for notifying the employee of their monitoring results. Each employee who wears a monitor should be shown the monitor report and acknowledge seeing the results by initialing the report by their name. Social security numbers

do not need to be used for identifying each employee. An employee number may be used for identification.

Records of employee exposure must be retained, even after the employee has left. Upon departure, each employee must receive a copy of their final monitoring report that shows their exposure for the entire employment period. The information on the periodic monitor report may be recorded on facility letterhead and include the phrase "This report is furnished to you under the provisions of Wisconsin Administrative Code, Chapter HFS 157, Radiation Protection. You should retain this report for future reference".

a. Individual monitoring devices must be worn at the unshielded location of the whole body likely to receive the highest exposure. When a protective apron is worn, the location of the individual monitoring device is typically at the neck (collar) [HFS 157.25(3)].

b. Additional individual monitoring devices used for monitoring the dose to the embryo/fetus of a declared pregnant woman must be located at the waist and under any protective apron being worn by the declared pregnant worker.

c. The individual monitoring device shall be assigned to and must be worn only by one individual.

d. When wearing a protective apron, multiple individual monitoring devices may be worn. When multiple devices are worn, occupational doses shall be determined in accordance with HFS 157.25(3)(b)

e. If multiple individual monitoring devices are worn by a declared pregnant woman, dose to the embryo/fetus and the occupational dose to the woman shall be determined in accordance with HFS 157.25(3)(b).

f. Individual monitoring devices which are not being worn and the control monitoring device will be stored in an area that is away from rooms where radiation machines are in use. This is in/at (specify location) .

g. (specify name) _____ is responsible for the occupational dose records and exchanging the individual monitoring devices on - (specify exchange dates) _____ . The individual monitoring device readings (film badge reports) are located in/at (specify posting or records location) _____.

h. If any employee's are working for another employer and receive an occupational dose, they shall report that dose to the RSO at each employer so that it can be included in their annual record of occupational dose. An employee working for a single employer and working at multiple sites must be assigned only one dosimeter, not one for each location. Employees are responsible for reporting their exposure from each job to each employer. The cumulative exposure from each job is the occupational exposure limit. No employee is allowed to receive more than 50 mSv (5 rem) in a calendar year from all employment during that year.

i. If any employee is pregnant or becomes pregnant, she may voluntarily inform the Radiation Safety Officer (RSO) or employer in writing of the pregnancy. If the RSO or employer is informed of the pregnancy, the employer must ensure that the dose to the embryo or fetus does not exceed 5 mSv (500 mrem) during the entire pregnancy and no more than 0.5 mSv (50 mrem) in any month. The dose to the monitoring device worn at the waist level is considered to be the fetal dose. Pregnant workers shall be monitored for radiation exposure if they routinely participate in the radiographic procedures. If the employee chooses to wear a leaded apron and have dosimetry, two monitors are recommended; one device will be worn at the neck and the second under the apron at the waist level. If an apron is not worn, only one monitor may be assigned and that shall be worn at the waist level.

If an employee does not declare their pregnancy in writing, for radiation safety purposes they are not considered to be pregnant and the 50 mSv (5 Rem) occupational exposure limit applies.

Top Ten Dosimeter Do's and Don'ts

- **DO WEAR IT** when working. It has no value in your locker or purse.
- **DON'T WEAR IT** when you are receiving x-rays for your own health care.
- **DON'T WEAR IT** away from the workplace.
- **DON'T WEAR IT** under your apron unless you are wearing two dosimeters. Leave your dosimeter in the same place every day when you leave work so you know where it is.
- **DO TURN IT IN** on time. Time gaps make analysis more difficult, less accurate and reduces legal and historical value of the reports.
- **DO PLACE** the control dosimeter in a radiation-safe area; the dose to the control is subtracted from each dosimeter and needs to be accurate.
- **DO REPORT LOST OR DAMAGED** dosimeters immediately. Prevent damage by not leaving your dosimeter in areas of high temperature such as your dashboard or in the clothes dryer.
- **DON'T PLACE** a dosimeter in an area for testing of stray radiation. Additional dosimeters can be assigned for testing.
- **DON'T SHARE** dosimeters; this is illegal. An average for a shared dosimeter is meaningless to each individual.
- **DON'T TAMPER with your dosimeter or anyone else's. The reports are legal documents and are regarded as real exposures received.**

3. ***Use of Protective Devices***

a. Use protective devices, such as lead aprons, gloves, and shields, to reduce exposure to radiation and keep radiation exposure as low as reasonably achievable (ALARA). Gloves or mittens must completely surround the hand. Hand flaps that cover the back of the hand do not provide sufficient protection because they do not stop the radiation scattering back from the cassette or table from exposing the palmer area.

Protective devices must be used or provided when it is necessary for an individual to remain in the room or hold an animal.

b. If fluoroscopic procedures are being performed, protective devices (lead drapes, hinged sliding panels) shall be in place to reduce the scatter radiation to the operator.

c. Protective gloves and aprons is/are stored in/at (specify location)_____.

d. Protective devices shall be checked annually for defects, such as holes, cracks, or tears. This check can be done by visually inspecting or feeling the protective devices or may also be done by x-raying these items. A record will be kept of this check [See Appendix C]. If a defect is found at the time of the annual check or on any other occasion, notify the RSO and remove the device from service until it can be repaired or replaced. Protective devices should be radiographed and the veterinarian should review the films for defects in the devices.

4. *Holding of animals and/or film*

DO NOT HOLD THE X-RAY TUBE HEAD DURING EXPOSURES! Mechanical tube head support must be provided at all times, even with portable x-ray equipment.

a. If an animal or film must be supported during a radiation procedure, use a mechanical holding device or sedation when circumstances permit.

b. If it becomes necessary for an individual to hold an animal or film, the holder shall not be pregnant. They must wear protective devices, must be wear an assigned dosimeter and keep unprotected body parts out of the direct beam.

5. *Posting Notices, Instructions, and Reports to Workers*

a. Employees must read the "Notice to Employees" sign posted in/at (specify location}_____The "Notice to Employees" form can be printed from the DHFS web site at: http://dhfs.wisconsin.gov/dph_beh/BEH/Xray/index.htm. (The form can be accessed from the left-hand column on that screen under "Publications".) The form needs to be posted on an employee bulletin board or employee accessible area. This is located at _____.

b. The certificate of registration, issued annually at the time of registration renewal, the operating and safety procedures and any notices of violations involving radiological working conditions are located in/at (specify location's)_____.

c. Your rights and obligations as a radiation worker are found in HFS 157.88, a copy of which may be found at (specify location)_____.

6. Radiation Incident or Overexposure

If any person suspects there has been an excessive exposure or a radiation incident such as unintentional exposure of the x-ray machine operator or another employee, immediately notify the RSO who will then notify the department by calling (608) 267-4784 or by faxing the information to (608) 267-4799. The department will investigate the alleged incident.

B. Operation of the X-ray Machine

1. Operator Location During Exposure

a. The operator must also be able to see every entrance to the room from the operator position. If the doors cannot be viewed directly, mirrors may be installed to view doors from the operator position.

b. During the exposure, the operator must be positioned so that the operator exposure is as low as reasonably achievable (ALARA) and/or a lead apron, gloves, or other shielding protects the operator.

c. If possible, only one person should be near the animal during the exam. Anyone else should be at least six feet away.

d. Foot operated exposure switches are acceptable and should be used by the person best able to determine the proper moment for the exposure.

2. Use of a Technique Chart

Technique charts are required for systems with adjustable techniques, such as kV, time and mA (x-ray tube current). Use of a technique chart aides in reducing the exposure to the operator and patient by providing a standard technique for a given machine regardless of the operator. Technique charts are displayed in the vicinity of the control panel of each x-ray machine.

Electronic technique charts programmed into the computer system that controls the x-ray machine are acceptable.

3. Restriction and Alignment of the Beam

The useful x-ray beam shall be restricted to the area of clinical interest. Use the centering and beam-limiting devices (collimator) provided on the x-ray machine. If the automatic collimator system fails, the RSO must be notified immediately and have the unit repaired. Automatic collimators must continue to function unless repair parts are no longer available. Units with apertures must have a means to center the x-ray beam to the image receptor or the area of clinical interest.

4. Use of Fluoroscopic Machines for Veterinary Use

a. Only the veterinarian or a trained operator assisting the veterinarian with a procedure may operate fluoroscopic machines. A trained operator may operate the unit and position the animal only under the direct supervision of the veterinarian. Direct supervision means in the same room.

b. Reset the 5-minute cumulative timing device before each fluoroscopic procedure.

c. Users of x-ray machines with accessible beams, including users of special radiographic or fluoroscopic procedures, shall also receive instruction on:

Effects of machine settings and usage on patient dose.
Source and intensity of scattered radiation.
Proper use of shielding.
Placement of dosimeters.

d. Anyone within six feet of the fluoroscopic unit or within six feet of the animal during the exam shall wear a lead apron that is 0.5mm lead equivalent at 100 kV for conventional C-Arm units or stationary units. Anyone within three feet of a Mini C-arm unit shall wear protective aprons.

e. All fluoroscopy devices must meet the requirements of Chapter HFS 157.76, Wisconsin Radiation Protection Code.

5. Film Processing [See Appendix B for sample record chart]

a. Unexposed film is stored (describe location and procedures for storage)_____
Unexposed film should be stored according to the film manufacturer instructions. This is usually in a temperature and humidity controlled location. Unexposed films stored adjacent to the x-ray room must be protected with at least 1/16" lead. This may be a lead lined film bin, box or cupboard.

b. Films shall be developed by the time and temperature recommended by the x-ray film manufacturer. These specifications are posted in/at (specify location)_____.
(This is usually near the processor in the darkroom)

(i) Check the temperature at the beginning of the workday using a thermometer that does not contain mercury. Do not process films unless the developer temperature is (specify temperature)_____.

(ii) Manual processing system temperature should be checked throughout the workday.

(iii) For automatic processors, run blank films through the processor at the beginning of the workday

c. Expiration dates on film and chemicals should be checked periodically. New film or chemicals should be rotated so the oldest are used first. Do not use films or chemicals after the expiration date. Pre-mixed developer has a shelf life of only 30 days and supplies must be used or discarded within 30 days of receipt.

d. Chemicals will be replaced by (specify name)_____according to the manufacturer's or chemical supplier's recommended interval, which is (specify frequency)_____, or no longer than every one month.

e. Safe light(s) in the film processing/loading area is/are provided under these conditions and should not be changed without authorization from the RSO.

Safe light filter type_____ (GBX recommended for blue or green sensitive film)
Bulb wattage _____
Distance from work surfaces _____(inches)_

f. If you see light leaks around doors, ceilings, or other openings in the darkroom, notify the RSO to have these light-leaks blocked.

8. Alternative Processing Systems

Users of daylight processing systems, laser processors, self-processing (Polaroid) film units, or other alternative processing systems shall develop procedures following manufacturer's recommendations for image/film processing and machine maintenance.

9. Darkroom

The darkroom needs to be light tight and ventilated. Ventilation is especially important if the control panel is located in the darkroom. Corrosive fumes can destroy the electronics in the control panel unless the fumes are vented out of the building.

Dust must be controlled in the darkroom. Ceiling panels in suspended ceilings can move up and down when the door is closed, releasing dust into the darkroom.

10. Quality Control

a. Screens in the cassettes and the type of film must be compatible. Never use green sensitive film with blue light emitting screens or vice versa.

b. Screens should be changed in the cassettes at least every five years and cassettes should be replaced if they become damaged, have light leaks or become warped. Screens age and lose their light-emitting ability and require higher radiation exposures.

c. Screens in the cassettes must be cleaned with a special screen cleaner at least once a month or when dust artifacts are noted on the films, whichever is shorter. Follow the cleaner manufacturer's instructions for cleaning. Never put film into wet cassettes. This will ruin the screens.

APPENDIX A

SAMPLE RECORD FOR INSTRUCTION OF INDIVIDUALS IN OPERATING AND SAFETY PROCEDURES FOR

(name of facility)

These procedures have been made available to each individual who operates the x-ray equipment on the date(s) indicated.

(Signature of RSO) (Date)

Equipment Operator Statement:

I have read these procedures and agree to abide by them.

(Signature of Equipment Operator) (Date)

(Signature of Equipment Operator) (Date)

(Signature of Equipment Operator) (Date)

(Signature of Equipment Operator) (Date)

(Signature of Equipment Operator) (Date)

(Signature of Equipment Operator) (Date)

APPENDIX B

SAMPLE DARKROOM REQUIREMENTS LOG FOR CALENDER YEAR

Automatic processor (Model #_____, Serial #_____) OR
Manual processing

Developer temperature _____

Chemicals replaced
(Manufacturer's or chemical supplier's recommendations or every 3 months)

(initials)_____(date) _____

(initials)_____(date) _____

(initials)_____ (date) _____

(initials)_____(date)_____

Darkroom light leak tests performed (every 6 months)

(initials)_____ (date) _____

(initials) _____(date) _____

Lighting checked in film processing/loading area:

filter type _____ (GBX recommended for blue or green sensitive film)
bulb wattage _____
distance from work surfaces _____ inches

(initials)_____(date)_____

(initials)_____ (date) _____

Light leaks or related deficiencies noted
(initials)_____(date) _____

(initials)_____(date) _____

Corrections of light leaks or related deficiencies (or attach service/work orders)

(initials)_____ (date)_____

APPENDIX C

SAMPLE PROTECTIVE DEVICES SURVEY (LEAD APRONS, GLOVES, THYROID SHIELDS, GONADAL SHIELDS)

ID# of shield	LIST DEFECTS(tears, holes, etc)	INITIAL of person	DATE of test

.

Appendix D
Radiation Monitoring Suppliers

Radiation monitoring devices may be obtained from:

ICN Dosimetry Service	Landauer, Inc	Quantum Products
800-251-3331	800-323-8830	800-359-9686

WARNING: Mention of a product, company or service does not constitute an endorsement by the Department of Health and Family Services but only serves to present information regarding the types of devices or services available to the user. Contact these vendors or your local x-ray service company or film supplier for further information.

Hand Film Processing Time and Temperature Chart

The temperature of each solution shall be maintained within the range of 60 ºF to 80 ºF (16 ºC to 27 ºC). Film shall be developed in accordance with the time-temperature relationships specified by the film manufacturer or, in the absence of such recommendations by the film manufacturer, with the following time temperature chart:

TIME-TEMPERATURE CHART

Thermometer Reading Minimum Immersion Time in the Developer

ºC	ºF	minutes
26.7	80	2
26.1	79	2
25.6	78	2 ½
25.0	77	2 ½
24.4	76	3
23.9	75	3
23.3	74	3 ½
22.8	73	3 ½
22.2	72	4
21.7	71	4
21.1	70	4 ½
20.6	69	4 ½
20.0	68	5
19.4	67	5 ½
18.9	66	5 ½
18.3	65	6
17.8	64	6 ½
17.2	63	7
16.7	62	8
16.1	61	8 ½
15.6	60	9 ½

The non-mercury thermometer shall Indicate the actual temperature of the developer to within +/- 0.5 ^{0}F

The timer shall signal the passage of a preset time as short as two minutes.

Film should be rinsed between the developer and fixer.

Immersion time in the fixer is usually twice that of the developer

A minimum of 15 minutes in flowing water is required for proper washing